

**REMARKS**

Applicants respectfully request reconsideration of this application, and reconsideration of the Office Action dated March 13, 2003 (Paper No. 7). Upon entry of this Amendment, claims 1-12 will remain pending in this application. Claims 1-6 are withdrawn. The amendments to claim 7 are fully supported by the original specification and original claims, for example, at page 15, lines 17-27. The amendments to claims 11 and 12 are only to correct punctuation. No new matter is incorporated by this Amendment.

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The Office Action asserts that the Title is not descriptive and thus requires a new title. In response, Applicants have amended the Title so that it is clearly indicative of the invention to which the claims are directed. Accordingly, the objection is overcome and its withdrawal is respectfully requested.

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The drawings are objected to because Figure 6 is considered to lack the designation --Prior Art--. In response, Applicants submit herewith a Letter With Proposed Drawings Corrections and an amended version of Figure 6. The amended version of Figure 6 includes the --Prior Art-- designation. Accordingly, the objection is overcome and reconsideration and withdrawal of the objection are respectfully requested.

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Claims 7 and 8 are rejected under 35 U.S.C. § 103(a) as purportedly obvious based on Mizuno et al. (U.S. Pat. No. 6,486,083) in view of Taylor et al. (LPCVD of Silicon ...). Applicants respectfully traverse.

The Office Action asserts that Mizuno discloses each feature of the claimed invention except for supplying hexachlorodisilane into the reaction vessel. The Office Action also asserts that Taylor teaches using hexachlorodisilane for forming silicon nitride films. The Office Action

thus concludes that it would have been obvious to combine the teachings of the two prior art documents and arrive at the claimed invention.

Independent claim 7 describes a precleaning method of precleaning a silicon nitride film forming system including a reaction vessel into which hexachlorodisilane and ammonia are supplied to form a silicon nitride film on a workpiece, and an exhaust pipe connected to the reaction vessel. The precleaning method includes supplying ammonia into the reaction vessel, discharging ammonia from the reaction vessel into the exhaust pipe, and reacting the ammonia with a Si-Cl-N-H compound remaining in the exhaust pipe to produce a Si-N-H compound to preclean the inside of the exhaust pipe. In other words, in Applicants' invention, ammonia is discharged from the reaction vessel into the exhaust pipe. Moreover, the Si-Cl-N-H compound remaining in the exhaust pipe reacts with the ammonia to produce the Si-N-H compound so as to preclean the inside of the exhaust pipe. As a result of Applicants' invention, the Si-Cl-N-H that is formed in the exhaust pipe during a heat treatment which uses hexachlorodisilane is reliably precleaned. *See Page 15, Lines 22-27 of the present specification.*

Mizuno describes a method of forming a silicon nitride film which includes charging  $\text{NH}_3$  gas from a charging port to purge the inside of a quartz reaction tube after a vacuum has been created in the reaction tube. While the  $\text{NH}_3$  is continuously charged into the reaction tube, BTBAS is also charged into the reaction tube. The BTBAS charging is stopped while the  $\text{NH}_3$  is continuously charged to again purge the reaction tube. *See Column 5, Lines 55-67.* As conceded by the Office Action, Mizuno fails to teach or fairly suggest supplying hexachlorodisilane into the reaction vessel. Accordingly, Mizuno can not teach or fairly suggest reacting the ammonia with a Si-Cl-N-H compound remaining in the exhaust pipe to produce a Si-N-H compound to preclean the inside of the exhaust pipe. Indeed, Mizuno does not teach or fairly suggest a precleaning method.

Taylor fails to remedy the deficiencies of Mizuno. While Taylor may generically teach that hexachlorodisilane can be used for forming silicon nitride films, there is nothing in the Taylor

disclosure which suggests discharging ammonia from a reaction vessel into the exhaust pipe so that the ammonia reacts with a Si-Cl-N-H compound remaining in the exhaust pipe to produce a Si-N-H compound to preclean the inside of the exhaust pipe. Furthermore, there are no teachings or suggestions in either prior art document to motivate combining their teachings to arrive at the claimed precleaning method. Accordingly, the combination of Mizuno and Taylor does not render the claimed invention obvious.

The amendments to claim 7 and above remarks overcome this rejection. Hence, reconsideration and withdrawal of the rejection are respectfully requested.

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~~Claims 9 and 10 are rejected under 35 U.S.C. § 103(a) as purportedly obvious based on~~  
Mizuno et al. in view of Taylor et al., and further in view of Saito et al (U.S. Pat. No. 6,159,298).

Claims 11 and 12 are rejected under 35 U.S.C. § 103(a) as purportedly obvious based on Mizuno et al. in view of Taylor et al., and further in view of Vasudev et al (U.S. Pat. No. 6,242,347).

These two rejections are addressed together as similar issues apply to each. Furthermore, Applicants traverse both of the above two rejections.

The deficiencies of Mizuno and Taylor are discussed above. Neither Saito nor Vasudev remedies the discussed deficiencies. Neither Saito nor Vasudev teaches or fairly suggests a precleaning method wherein ammonia is discharged from a reaction vessel into the exhaust pipe so that the ammonia reacts with a Si-Cl-N-H compound remaining in the exhaust pipe to produce a Si-N-H compound to preclean the inside of the exhaust pipe. Furthermore, there is nothing in the teachings of the prior art of record which would have motivated those of ordinary skill to have combined the teachings of the prior art and arrive at the claimed invention. Accordingly, none of the asserted combinations renders the claimed invention obvious.

The amendments to claim 7 and above remarks overcome this rejection. Hence, reconsideration and withdrawal of the rejection are respectfully requested.

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Applicants respectfully submit that this Amendment and the above Remarks obviate the outstanding objections and rejections in this case, thereby placing the application in condition for immediate allowance. Allowance of this application is earnestly solicited.


If any fees under 37 C.F.R. §§ 1.16 or 1.17 are due in connection with this filing, please charge the fees to Deposit Account No. 02-4300; Order No. 033082.119.

If an extension of time under 37 C.F.R. § 1.136 is necessary that is not accounted for in the papers filed herewith, such an extension is requested. The extension fee should be charged to Deposit Account No. 02-4300; Order No. 033082.119.

Respectfully submitted,

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## LISTING OF THE CLAIMS

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Claims 1-6 (withdrawn)

**A** Claim 7 (currently amended): A precleaning method of precleaning a silicon nitride film forming system including a reaction vessel into which hexachlorodisilane and ammonia are supplied to form a silicon nitride film on a workpiece, and an exhaust pipe connected to the reaction vessel, said precleaning method comprising the steps of:

supplying ammonia into the reaction vessel; ~~and~~

~~discharging ammonia from the reaction vessel into the exhaust pipe; and~~

reacting the ammonia with a Si-Cl-N-H compound remaining in the exhaust pipe to produce a Si-N-H compound to preclean the inside of the exhaust pipe.

Claim 8 (original): The precleaning method according to claim 7, wherein the reaction chamber is heated at a temperature in the range of 500 to 900 °C, while ammonia is supplied into the reaction vessel.

Claim 9 (original): The precleaning method according to claim 7, wherein the exhaust pipe is heated at 100 °C or above, while ammonia is discharged into the exhaust pipe.

Claim 10 (original): The precleaning method according to claim 7, wherein a pressure within an interior of the exhaust pipe is set at pressures in the range of 665 to 66500 Pa, while ammonia is discharged into the exhaust pipe.

Claim 11 (currently amended): The precleaning method according to claim 7 further comprising a step of supplying an inert gas through the reaction vessel into the exhaust pipe, before the step of supplying ammonia into the reaction vessel.

A  
end

Claim 12 (currently amended): The precleaning method according to claim 7 further comprising a step of supplying an inert gas through the reaction vessel into the exhaust pipe, after the step of supplying ammonia through the reaction vessel into the exhaust pipe.

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